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MANUAL FOR FUMIGATING MEXICAN FRUITS  
WITH ETHYLENE DIBROMIDE //

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4/ 4th  
This publication (fourth edition) supersedes unnumbered publication entitled, "Manual for Fumigation of Mexican Fruits with Ethylene Dibromide," (third edition) issued August 1963.

**WARNING:** Fumigant can be fatal if inhaled. Do not breathe vapor. Do not get in eyes, on skin or on clothing. Severe burns can be caused by contact. Keep away from heat. Keep container closed. Use only according to directions.



*Use Pesticides Safely*  
**FOLLOW THE LABEL**

U.S. DEPARTMENT OF AGRICULTURE

2 or  
2 U.S. Plant Quarantine Division,  
Agricultural Research Service,  
United States Department of Agriculture  
Federal Center Building  
Hyattsville, Md. 20782

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MANUAL FOR FUMIGATING MEXICAN FRUITS  
WITH ETHYLENE DIBROMIDE

SECTION I - INTRODUCTION

This manual (fourth edition) serves as an operational guide for Plant Quarantine Inspectors of the Plant Quarantine Division, Agricultural Research Service, U. S. Department of Agriculture, engaged in supervising ethylene dibromide (EDB) fumigation of designated fruits at treating plants located in Mexico. The treatments and safeguard measures described herein are in accordance with the provisions in Quarantine 56 (7 CFR, §319.56-2). Supervising inspectors will be notified of any changes made in the Code of Federal Regulations (CFR) and any modifications in procedural practices issued by the regional supervisor.

References to commercial concerns and their products are included for information purposes only, without any given or implied guarantee or warranty as to the reliability of the firms or endorsements of their products by the U. S. Department of Agriculture. No attempt has been made to make the references complete, and no discrimination is intended or implied against firms whose name or products are not listed.

SECTION II - REGULATIONS ON EDB FUMIGATION

Regulations governing EDB fumigation are based for (1) citrus in 7 CFR, §319.56-2e and for (2) mangoes and plums in 7 CFR, §319.56-2j.

SECTION III - THE FUMIGATION CHAMBER

A. Approval

1. Under the supervision of Plant Quarantine Inspectors, fruits required to be treated in Mexico as a condition of entry into the United States must receive EDB treatment in fumigating chambers at treatment plants by the Plant Quarantine Division. Application for approval of treatment plants should be submitted to the Supervisor, Southwest Region, Plant Quarantine Division, Agricultural Research Service, USDA, P. O. Box 909, Brownsville, Texas 78520. The approval will be based on:
  - a. Location of the plant.
  - b. Conformance to requirements in architectural design.
  - c. Performance requirements.
  - d. Compliance with prescribed safeguard measures.
2. Prior to approval, chambers will be inspected and tested by a qualified representative of the Plant Quarantine Division. When deemed necessary, further tests may be made; that is, after a period of idleness or after modification of chamber or equipment.
3. Information concerning approved fumigation facilities that operate under Plant Quarantine Division supervision may be obtained from the Supervisor, Southwest Region, PQD, ARS, USDA, P. O. Box 909, Brownsville, Texas 78520.

## B. Supervision of Treatment Procedure

Supervision of treatment procedures and related activities is performed by inspectors stationed at ports of entry along the United States-Mexican border. Such service depends on the availability of inspectors because port inspection activities may limit the number of facilities that can be supervised in Mexico.

## C. Location of Plants

The plant locations listed below are approved for treatment under supervision of the Plant Quarantine Division:

### 1. Interior of Mexico

- a. Allende, Nuevo Leon, Mexico
- b. Cadereyta, Nuevo Leon, Mexico
- c. General Teran, Nuevo Leon, Mexico
- d. Linares, Nuevo Leon, Mexico
- e. Montemorelos, Nuevo Leon, Mexico
- f. Victoria-Carmen, Tamaulipas, Mexico
- g. Rio Verde, San Luis Potosi
- h. El Friale, Nuevo Leon, Mexico
- i. Santa Engracia, Nuevo Leon, Mexico

### 2. Contiguous to ports of entry

- a. Ciudad Juarez, Chihuahua
- b. Nuevo Laredo, Tamaulipas

## D. Architectural Design

### 1. General

Plant operators are restricted in design of fumigation chambers only to the extent that the fumigant must be evenly distributed in the room. The design specifications in this publication are taken from the rooms previously tested and found to distribute EDB properly. Technical personnel with special equipment must study variations from specifications before he will approve the design of the chamber. Major variations from these specifications should be submitted in writing, accompanied by drawings, to the Supervisor, Southwest Region, PQD, ARS, USDA, P. O. Box 909, Brownsville, Texas 78520.

### 2. Approved Plans

Illustrations of approved plans are shown in Fig. 1 to 6, inclusive, shown in Section XII.

### 3. Specifications

- a. Construction. The chamber may be constructed of (1) concrete, tile, or brick with plastered walls and ceiling, or of (2) frame lined with a gas impervious material. This includes metal or tin lining properly sealed.

- b. Dimensions. Common size of the fumigation chamber for commercial use is 20 by 30 by 10 feet. Generally, sizes of the rooms are so designed to hold the capacity of one or two railroad carloads. The 20 by 30 by 10 foot room will hold approximately two



carloads of citrus or mangoes. Considerable latitude is permitted, provided the room is approximately  $1\frac{1}{2}$  times as long as it is wide. The ceiling should be 8 to 10 feet high.

- c. Doors. Doors of sturdy construction should be located close to the processing machinery and loading docks. They must close on a complete refrigerator-type gasket and be clamped during fumigation.
- d. EDB volatilizing equipment. The liquid EDB is volatilized in either an enamel or stainless steel (not aluminum) container over an electric hotplate mounted in the airstream of the duct system and must be visible from the outside through a gastight glass viewplate. Switches for the control of the hotplate, light bulbs, and room circulation blower must be on the outside near the glass viewplate.
- e. Interior surfaces.
  - (1) All nonmetal materials used in the interior construction of chambers must be painted with two coats of one of the following paints or equivalent:
    - (a) (Senox Epoxy Coating or Sentry Senox 63) Tampa Paint and Varnish Co., Box 31 Tampa, Florida 33601
    - (b) (Sherwin Williams Phenolic Varnish-Catalog No. V765V7) Sherwin Williams Co., Chicago, Ill. 60690
    - (c) (Tropoxy No. 2) Tropical Paint and Oil Co., Cleveland, Ohio 44121
    - (d) (Valpon Enamel) Valdura Division, American Marietta Company, Chicago, Ill. 60680
    - (e) (Proco Epoxy Coating) Protective Coating Company, Tampa, Florida 33601
    - (f) (Rust-Oleum, chemical resistant paint 200 series) Rust-Oleum Corp., 2425 Oakton St., Evanston, Illinois 60202
    - (g) (Epi-Res 285) Jones-Debney Co., Resins and Chemicals Division, Louisville, Ky. 40201
    - (h) (Cupon Grey EA-4-204) Coast Paint and Lacquer Company, Houston, Texas 77011
    - (i) (Chemkoat No. 600) P.G.Devran Chemkoat Co., 233 No. 15th St., Louisville, Ky. 40203
    - (j) (Matcote 8401) Matcote Company, Inc., P. O. Box 10762, Houston, Texas 77018
  - (2) All cracks, seams, joints, or other openings must be sealed gastight with permanent sealing material. Sealing compounds that have proved to be effective are plaster of paris, asbestos fiber roofing compound, plastic cement, and solder - all available at most paint and lumber supply stores.

#### 4. Circulation System Specifications

- a. False floor. The EDB vapor upon entering the room passes through the load to the false floor duct system which conveys the fumigant to the base of the return duct. Two false floor constructions (Figs. 1-4) are approved. Cement construction details are shown in Figs. 2 and 4. The wood false floor details are shown in Figs. 1 and 3. The wood false floor is constructed of 2 by 6 inch boards spaced  $\frac{3}{4}$  inches apart at a  $45^{\circ}$  angle to the walls, and 2 by 10 inch floor joists radiating from a vertical conduit in the center of one side of the room to support the floor boards and to form air ducts. The false wood floor should be built in removable sections to facilitate its removal for cleaning and painting.
- b. Motor and blower. A motor driven rotary-type blower, sufficient to change the air once a minute against a 1 inch water column static pressure, is required. In the 5,000 to 6,000 cubic foot rooms the American Hi-Speed model 270 multivane, centrifugal-type blower has been found satisfactory, although smaller motors probably can change the air more economically. Motors should operate from 220 volt power supply. (See Fig. 5)
- c. Delivery duct. The delivery duct extends from the blower to the center of the ceiling and expels the fumigant against a baffle plate.
- d. Baffle plate. A perforated baffle plate is suspended 8 or 10 inches below the discharge opening in the ceiling to distribute the vapor evenly over the top of the load (see Fig. 3).
- e. Return duct. The fumigant passes from the ducts of the false floor into the return duct to the intake side of the blower.
- f. Exhaust vent. When treatment is completed the fumigant is discharged to the outside atmosphere through a damper arrangement. Clean air must be passed continuously through the load while the vapors are being exhausted. Caution should be taken to construct the exhaust stack so that the discharged fumigant will not contaminate animal or human habitation in appreciable concentrations (see Fig. 6).
- g. Steam radiators. Radiators aid in bringing fruit up to required temperatures. The equipment is optional. Where steam is available, it can be introduced into radiators for dry heat directly in the return air duct. Such equipment should be protected with adequate safety valves.
- h. Vaporizing unit. The vaporizing unit includes all metal duct work outside of the chamber. All metal work for the vaporizing unit should be of No. 22 or No. 24 gauge galvanized sheet metal. All new and rebuilt chambers (see Fig. 5) must use this vaporizing unit.

#### E. Performance Requirements

1. The chamber must be gastight.
  - a. The room is required to hold a kerosene manometer pressure of from 50 to 5 ml. reduction in 22 seconds or more.
  - b. Faint gas leakage at door gaskets or other locations normally would not require shut down of a fumigation chamber, but leakage should be called to the attention of the plant operator. Large quantities of gas escaping from a chamber is sufficient reason to stop further treatments until repairs are made. It is the responsibility of the supervising inspector to require plant operators to keep the treatment chamber in repair.
2. The electrical equipment must be installed in a safe and acceptable manner to provide constant service.
3. The volatilization period of the EDB must be not less than 12 minutes and not more than 30 minutes from the time the EDB begins to boil.
4. The blower must circulate the entire mass of air inside the room ~~in 1 minute~~. Blower tests are made when the chamber is empty. *at least once every 3 minutes*

#### F. Compliance with Prescribed Safeguard Measures

1. The owner or operator of a fumigation chamber is responsible for performing a fumigation in a manner to meet required dosage schedules, treatment practices, and sound safety practices.
2. The operator should be present throughout the entire treatment period and be familiar with directions for use of the fumigant, operation of the chamber, and emergency measures.
3. First aid kits, gas masks, and other emergency supplies should be available and in good condition at all times.

#### G. Load Requirements

1. General
  - a. Nothing will be included in the load except the commodity, containers, and authorized packing material.
  - b. The load will be evenly distributed throughout the entire room so that the top of the load is as level as possible.
  - c. Unused sections of the floor that are not covered will be blocked off in such a way as to prevent air movement into the false floor ducts.
  - d. Bulk fumigations are not authorized.



- e. The percentage load limit measurements are derived from the percentage of the total height of the chamber. The percentage height desired is then measured from the top of the false floor. For example, to determine a 50 percent load limit of a chamber 10 feet high by 20 feet wide by 30 feet long, multiply the 10-foot height by 50 percent of the room volume. The 5-foot load limit is then marked off from the top of the false floor. A 10 by 20 by 30 foot chamber has a volume of 6,000 cubic feet, and a 50 percent load would make the measurements 5 by 20 by 30 feet, or a volume load of 3,000 cubic feet. By measuring from the top of the false floor, a part of the unloaded volume of the chamber would be that area occupied by the false floor and the rest would be that unoccupied space above the load.

## 2. Citrus

- a. The boxes or containers must be stacked evenly over the total floor surface and stacks separated by at least 2 inches. Spacing between boxes in a stack may be required if such spacing is necessary to insure adequate circulation of gas.
- b. The load should not exceed 80 percent of the volume of the chamber.

## 3. Mangoes and Plums

- a. When loaded in the fumigation chamber, the boxes or containers of mangoes and plums shall be separated at least 1 inch on all sides by wooden strips or other means.
- b. Load will not exceed 50 percent the volume of the room for plums or 80 percent for mangoes. The load will be arranged so as to insure good distribution of gas.

# SECTION IV - THE FUMIGANT, ETHYLENE DIBROMIDE

## A. Formula

(1, 2 dibromoethane)  $\text{CH}_2\text{BrCH}_2\text{Br}$

## B. Characteristics

1. EDB is a colorless, chloroform-like liquid.
2. Very slow solubility in water.
3. Slow deterioration in light.
4. Indicates green to blue flame with halide detector.
5. Forms a vapor when volatilized.
6. No danger of fire.

## C. Properties

1. Boiling point:  $264^{\circ}\text{F.}$  to  $269^{\circ}\text{F.}$
2. Specific gravity: 2.150 to 2.190 at  $75^{\circ}\text{F.}$  to  $79^{\circ}\text{F.}$
3. Flash point: none.
4. Explosive limits: none.

#### D. Standards

Purchasers of EDB for commodity fumigations should specify:

1. Technical grade (97 to 100 percent) EDB.
2. Specific Gravity: 2.150 to 2.190 at 75°F. to 79°F.
3. The volume between 5 and 95 percent shall boil at 269°F. and at temperatures within 3.6°F. thereof.

#### E. Some Sources of Supply

1. Abash Insect Control Service, McAllen, Texas 78501
2. American Potash & Chemical Company, 3030 - 6th St. W.,  
Los Angeles, California 90005
3. California Spray Chemical Corp., Richmond, Calif. 94801
4. The Dow Chemical Company, Midland, Michigan 48642
5. Eston Chemical, Inc., 3100 E. 26th Street,  
Los Angeles, California 90023
6. Niagara Chemical Division, Food Machinery & Chemical Corp.,  
Middleport, New York 14105
7. Food Machinery Corporation, McAllen, Texas 78501

#### F. Symptoms of EDB Poisoning

EDB poisoning may result from ingesting, inhaling, or absorbing through the skin.

1. Depressing effect on respiration, blood pressure, and knee jerk.
2. Headaches.
3. Nausea.
4. Unconsciousness.

#### G. First Aid

Call a doctor, if symptoms of EDB poisoning occurs and perform the following for:

##### 1. Ingesting:

- a. Remove patient to fresh air.
- b. Induce vomiting.
- c. Remain calm.

##### 2. Inhaling:

- a. Remove patient to fresh air.
- b. Keep patient quiet.

##### 3. Absorbing:

- a. Wash affected area copiously with soap and water.
- b. Remove contaminated clothing.



## H. Toxicity to Humans

Estimates of maximum exposures of EDB believed safe for human subjects based on single exposures not more than once a week, as recommended by the American Conference of Governmental Industrial Hygienists, are:

<u>TIME</u>	<u>PARTS PER MILLION IN AIR</u>
600 min. ....	800
1 hour .....	200
7 hours .....	50
8 hours each for 5 days <u>1/</u> .....	25

## SECTION V - TREATMENTS

Plant Quarantine regulations provide for four types of treatments known to be effective against Mexican fruit fly larvae: (1) Freezing, (2) Cold treatment, (3) Vapor-heat, and (4) EDB fumigation.

The fumigation treatment herein described is a method whereby EDB vapors are introduced into a specifically designed chamber, loaded with fruit to a certain level and exposed for a specified period of time during which the admixture is continually circulated, and then exhausted from the chamber and fruit.

### A. Method

#### 1. Introduction of vapor

EDB is a liquid at normal atmospheric temperatures. It must be vaporized to be effective in the treatment. The acceptable means of volatilization is heating over an electrical hotplate in an enamel or stainless steel pan. The vapor is mixed with the circulating air by the blower, which should operate continuously through the volatilization period and the 2-hour period.

Condensation of the vapor will usually occur if there is an improper mixture or a stoppage in the air movements. Condensation is undesirable for two reasons: (1) possibility of injury to the fruit from EDB burns, and (2) possibility of a reduction in pest mortality. Proper mixture can be obtained by introducing the vapors directly into the air stream of a system that circulates the entire mass of air in the chamber in 1 minute with the chamber empty.

#### 2. Distribution of EDB

A system that circulates the entire air-gas mass within an empty chamber in 1 minute is the rate of circulation necessary to distribute the vapors properly. Forced circulation is used in this treatment specifically to augment the normal properties of penetration and diffusion of EDB.

#### 3. Exposure period of EDB

Exposure period of EDB shall be for 2 hours from the time EDB is completely volatilized.

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1/ Ceiling limit for 1 week.

#### 4. Exhaust of vapors

EDB is removed from the chamber at the end of the exposure period by forcing clean air from the outside through the load and exhausting the vapor through the circulation system to the outside atmosphere.

#### B. Dosage Calculations

1. Three methods for calculating the amount of EDB to use for a treatment are given below on an example dosage of 1 pound EDB per 1,000 cu. ft. for a chamber volume of 5,400 cu. ft.

a.  $\frac{5,400}{1,000}$  cubic feet x 16 oz. = 86.4 oz. EDB

$86.4 \text{ oz.} \times 13.05$  (no. of cc's in 1 oz. EDB)  
= 1,127.52 cc EDB

b. 5,400 cubic feet x 0.2088 (a pre-established factor)  
= 1,127.52 cc EDB

c. 16 x 70.47 (a pre-established factor)  
= 1,127.52 cc EDB

2. The dosage in cubic centimeters of EDB for each approved fumigation chamber in Mexico, as well as chamber dimensions, is available from the Supervisor, Southwest Region.

#### C. Approved EDB Schedules

The EDB dosage schedules below are approved for oranges, grapefruit, tangerines, plums <sup>1/</sup>, and mangoes.

<u>Fruit load in chamber</u>	<u>Dosage of EDB in oz. / 1,000 cu. ft. / 2 hours</u>		
	<u>50°F.-59°F.</u>	<u>60°F.-69°F.</u>	<u>70°F. or above</u>
25% or less	12 oz.	10 oz.	8 oz.
26% to 49%	14 oz.	12 oz.	10 oz.
50% to 80%	16 oz.	14 oz.	12 oz.

Post-treatment aeration in the fumigation chamber for 30 minutes is required.

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<sup>1/</sup> Fruit load for plums will not exceed 50 per cent the volume of the fumigation chamber.

## SECTION VI - COMMODITY CONTAINERS

Except for minor restrictions, containers used in the various commodity trades are acceptable as noted below.

### A. Cardboard Containers

No waxing of containers is permitted. Cardboard containers must be provided with sufficient slots or perforations to permit diffusion of the vapor in and out of the container. Containers not already approved may be submitted to the Division for approval or disapproval.

### B. Wooden Boxes

Standard containers should be used, when possible. Wooden containers should be either slatted or provided with openings for diffusion of the fumigant; such containers should not exceed two bushels in capacity.

### C. Polyethylene Bags

Five-pound polyethylene bags with a minimum of twenty  $\frac{1}{4}$  inch perforations equally spaced on either side are authorized. Larger bags with proportionally more openings may be used. Sacks or bags must be treated in containers.

### D. Mesh Bags

Mesh cloth or loosely woven burlap bags (including jute) are authorized and may be used in connection with master or "mother" containers or independent of containers. Loosely woven burlap bags up to 36 inches wide with capacity of 70 to 90 pounds of fruit are approved for fumigation of citrus.

### E. Expanded Metal Baskets

Baskets constructed of about 39 by 60 inch expanded metal with at least 80 to 90 percent exposure are approved.

### F. Wrappers

Citrus wrapped in conventional tissue is authorized.

### G. Box Liners

Full paper liners are not authorized. "No-cuts" or corner protectors may be used with citrus.

### H. Packing Materials

Excelsior used in the mango trade is authorized.



## SECTION VII - CERTIFICATION

A shipment is certified in writing on PQ Form 369 or PQ Form 3. This certification covers treatment, processing the fruit for packing, packing into containers, storing, loading, and other safeguard factors concerning the shipment.

### A. Treatments

The plant operator is responsible for treating the fruit. The plant quarantine inspector supervises the treatment and advises in matters pertinent to the treatment. This supervision, among other things, includes:

#### 1. Checking the chamber

- a. Dampers - if in an unsatisfactory condition, delay treatment until fault is corrected; if the malfunction is minor, require necessary repairs be made before the next treatment.
- b. Door and vent seals - same as 1,a.
- c. Motor and blower - same as 1,a.
- d. Debris in false floor ducts - require cleaning if a noticeable amount of debris is visible.
- e. Hotplate and electric light bulb - delay treatment until malfunction is corrected.
- f. Leaves on floor - remove before fumigation.
- g. Paint on walls and floor surfaces - if worn, require repainting before the next treatment.

#### 2. Checking the load

- a. Fruit and boxes must be dry.
- b. Fruit must be within treatment temperature.
- c. Top of load must be as level as possible.
- d. Load must be evenly distributed.
- e. Unused floor areas must be blocked off by placing boards over openings in false floor.
- f. Extraneous items must be removed from the room before fumigation begins.

#### 3. Checking the fumigant

- a. New containers of EDB must be checked with a hydrometer to determine the specific gravity.
- b. The specific gravity must be between 2.150 and 2.190 at 75°F. to 79°F.
- c. Read the bottom of the meniscus for accuracy.
- d. Hydrometers available at:
  - (1) Scientific Glass Apparatus Company  
Bloomfield, New Jersey 07004
  - (2) Emile Greiner Company  
2-26 N. Moore Street, New York 10004
- e. Crystals will appear in liquid EDB as it cools to about 40°F. Crystallizing of EDB is equivalent of freezing - this can be prevented by storing containers of EDB in rooms above 40°. If crystals appear, warm container gradually. Care should be taken to store containers where volatilization will not occur.

#### 4. Sealing the chamber

Before introducing the fumigant into the chamber the inspector should:

- a. Determine that all personnel is out of the chamber.
- b. Determine that all doors, vents, and gate valves are closed.
- c. Padlock doors, vents, and gate valves where necessary. Inspectors must be familiar with chambers that have locks.
- d. Caution. Whenever closing refrigerator-type doors, the inspector should shut the blower off and temporarily open the vent to prevent damage to seals that might occur from sudden pressure buildup.

#### 5. Introducing the fumigant

- a. The inspector should verify the quantity of EDB introduced.
- b. The EDB should be brought to a boil so the vapor can be mixed with the circulating air by the blower which must remain in operation through the volatilization period and during the treatment.

#### 6. Timing the exposure

- a. A 2-hour period is required for the actual treatment with the blower operating the entire time.
- b. Any breakdowns in the machinery or removal of the fumigant nullifies the treatment. In such cases the load must be completely aerated before a new treatment is started. Afterwards, a new treatment must be given.

#### 7. Exhausting the fumigant

EDB should be exhausted immediately after the end of the exposure period. Only a small part of EDB remains in the air at the end of the treatment because most of the EDB will have been sorbed by the boxes and the fruit. Diffusion of the EDB from the fruit and the boxes is a slow process. An exhaust fan should be in operation at all times when storing fresh-treated fruit in the chamber or a room.

Caution. It is dangerous for personnel to be confined in a chamber or room where fresh-treated fruit is stored, pending shipment.

To exhaust a chamber, the inspector should:

- a. Turn off blower before opening vents to prevent damage to seals.
- b. Open clean air vent, exhaust gate valves, and doors.
- c. Start the blower.
- d. Operate exhaust for a minimum of 15 minutes before entering the chamber.



## B. Processing

Processing involves handling the fruits from the time it enters the packing plant until it is packed. Processing may be before or after the EDB treatment. The requirements in the processing are (1) that all unsound fruit be removed, and (2) that all citrus leaves and other objectionable plant material be removed from the load before packaging.

### 1. Removal of unsound fruit

All unsound fruit should be removed before packing.

### 2. Removal of other objectionable plant material

Removal of all leaves, stems, and other objectionable plant material is required to prevent the accidental introduction of plant pests associated with leaves, stems, and other plant materials. The citrus blackfly, in particular, is a threat to the citrus industry of the United States. Unfortunately, EDB is not effective against this pest.

Tangerines are picked with long stems to prevent rupturing the tender skins. Stems up to one-half inch long are permitted to remain attached to the fruit. Under Plant Quarantine supervision, longer stems must be removed at the grading tables by packing house employees equipped with special clippers.

### 3. Packing plant

Procedures used in a packing plant including the transporting, treating, warehousing, and storing of fruits must conform to and be consistent with safeguard practices of the Plant Quarantine Division. These safeguard practices, among other things, should insure against the accidental, careless, or intentional fouling or contamination of treated fruit.

Packing plant operators should:

- a. Use equipment designed to prevent leaves from being distributed to the floors of the fumigation chamber and the packing plant.
- b. Remove and destroy all leaves and extraneous fruit fly breeding media from the premises.

### 4. Prevention against contamination

Successful prevention against contamination depends on:

- a. Adopting and implementing proper procedures.
- b. Cooperation of the operator and employees adhering to these proper, established procedures.
- c. The inspector succeeding in enforcing these established procedures.

## 5. Factors contributing to contamination

Some factors contributing to contamination are:

- a. Failure to practice good, sound plant quarantine safeguard measures.
- b. Close contact of treated or untreated fruit when moved or stored where it might be mixed.
- c. Plant employees possessing untreated fruit while processing treated fruit.
- d. Processing treated fruit through machinery that is fouled with untreated fruit.
- e. Failure to clean areas where prepacked fruit is stored.

## 6. Procedures

- a. Post-packed fruit refers to fruit that is processed and packed after EDB treatment. The inspector supervises the entire post-packing process to prevent the accidental introduction of untreated fruit with treated fruit. Before space and machinery are used for post-packed fruit, the inspector must make sure all untreated fruit is removed from the area. The machinery and the washing tanks must be removed.
- b. Prepacked fruit refers to fruit that is processed and packed before EDB treatment. Approved shippers may be authorized to prepack without plant quarantine supervision, however, such prepacked fruit is subject to 100 percent inspection. Prepacking approval is provisional and does not necessarily eliminate the supervision requirement. Tangerines may not be prepacked.
- c. Processing citrus fruit

### (1) General

The commercial machinery used in the citrus industry for processing fruit to prepare the pack is normally sufficient for removing leaves and other objectionable plant materials, including unsound fruit. Hand processing is slow and less effective as a rule. The use of modern equipment should be encouraged to reduce the amount of time required for supervision.

The machinery consisting of a series of machines performs related tasks efficiently. Usually the machinery follows the order of (a) washing, (b) dye coloring, (c) drying, (d) waxing, (e) marking, (f) grading, and (g) sizing. It is a continuous line connected by rollers, brushes, and conveyor belts. Removal of undesirable material occurs at one point or another when the fruit passes through or over this machinery. Any remaining material that should not be placed in the pack is removed by hand at the grading table before it reaches the bins.



## (2) Tangerines

- (a) All stems exceeding one-half inch should be eliminated in the field. Constant supervision in the packing shed is necessary to prevent improperly cut stems from being packed.
- (b) Packaging of tangerines without supervision as in the case of other citrus is not authorized.
- (c) Only the machinery necessary to remove loose leaves from the fruit before it reaches the grading table is required.
- (d) Tangerine stems are individually cut during this grading table operation.

### d. Processing mangoes and plums

No machinery is employed in Mexico for processing these commodities. The handpacking of these fruits in lugs or cardboard containers even by trained personnel requires the inspector to render close supervision and constant inspection of the containers.

### e. Packing

See Section VI for containers, liners, wrappers, and packing materials used in packing fruit.

## C. Stamping Containers of Treated Fruit

All containers of treated mango fruit must be stamped with an official imprint indicating the commodity has been fumigated. Stamping of containers with other fruits is not required.

## D. Storing, or Warehousing, After Treatment

The storing, or warehousing, of prepacked or treated fruit must conform to and be consistent with good, sound plant quarantine safeguard practices.

- 1. Storage of treated fruit must be done under supervision of a plant quarantine inspector and safeguarded with approved seal or lock. After treatment, fruit may be held under seal in the treatment chamber pending shipment, or under tarps when approved by the inspector.
- 2. Storage of treated and untreated fruit in the same room is prohibited.
- 3. Treated fruit must be safeguarded while in storage to prevent reinfestation or contamination.

## E. Shipping

Shipping includes the loading of the carrier and moving the treated fruit to the United States.

- 1. Only treated fruit can be included in a load. Mixed loads of treated and untreated fruit will not be certified.
- 2. The carrier must be free of citrus leaves or other objectionable plant material, or the load will not be certified.

3. The plant quarantine inspector must supervise the loading of the carrier and verify the load and count for certification.
4. The load, if not in a van-type truck, must be properly covered immediately after loading and remain properly covered until its arrival at the United States port of entry.
5. Bulk shipments will not be certified.
6. Should a shipment be transshipped from a Mexican port aboard a vessel, the transfer in Mexico from the treatment or storage area to the vessel must be under the supervision of a plant quarantine inspector until it is in an enclosed space aboard the vessel and sealed. Seals must remain intact during the voyage.

#### F. Forms for Certification

A plant quarantine inspector will certify each shipment after he is satisfied that all the requirements have been met. (See sample forms PQ 369 and PQ 3, Section XI). The original of the form accompanies the shipment to the port where it should be attached and filed with the PQ Form 368.

Inspectors will indicate the class of product under "Commodity" when certifying shipments. Example: Oranges, grapefruit, and plums. Shipments of four 20-pound bags of citrus are entered as a container size. The total number of these bags is entered as "No. of containers." Trailer vans not having license plates are marked by the inspector with a number inside the rear doors and so designated under "Remarks." Other entries are self-explanatory.

### SECTION VIII - BASIC SAFEGUARD PROCEDURES INVOLVED IN EXPORT AT MEXICAN MARITIME PORTS

#### A. Containers

Fruit is to be transported from the field to the packing and treating plant in bulk or in containers differing from those used for export purposes. All old container identification tags or lot number marks must be removed or crossed out by the exporter when the containers are reused.

#### B. Supervision of Treatment

Fruit must be completely free of leaves and other plant debris when packaged in containers for treatment and export. Closed containers of fruit are to be conveyed into the treatment chamber and fumigated where the containers are stacked under direct supervision of the plant quarantine inspector. After treatment and aeration, the fruit is moved from the chamber to an approved storage area under plant quarantine supervision. The containers are stamped with assigned lot number. The number of treated containers is recorded in a log by fruit variety.



### C. Storing

When necessary to store treated fruit awaiting arrival of a ship, it shall be stacked in a special barricaded area well apart from untreated fruit and fruit-packing operations. The plant quarantine inspector shall keep a record of stamped containers stored under these circumstances.

### D. Loading

When fruit is to be transported from the treating plant to the pier for loading on an export vessel previously cleared by the plant quarantine inspector, the loading foreman must check out each load. The foreman must ascertain that each container is closed and bears the proper lot number. He must also provide a load receipt listing the total number of containers in each load for the dockside checker and the plant quarantine inspector. The dockside checker must not permit the loading of containers without proper lot number mark. He should immediately notify the plant quarantine inspector of any variation in lot numbers or number of fruit containers received from that checked out at the treating plant. Moreover, fruit shipped to countries other than the United States shall not be loaded in same compartment with fumigated fruit which is destined for the United States.

### E. Certification

When the loading of the vessel with fruit is completed, the plant quarantine inspector should proceed to the pier and compare his records of fruit containers treated and dispatched from the premises with records of marked fruit containers checked aboard ship by the dockside checker. If all is in order, he should issue PQ Form 3 (see page 22), Foreign Site Certificate of Inspection and Treatment, in quadruplicate. The original is airmailed to the Inspector in Charge at the port of arrival, one copy accompanies the vessel, one copy to the contracting agency, and one for local Plant Quarantine Division file. The plant quarantine inspector at the U. S. port of arrival shall provide surveillance of fruit during discharge to assure that the containers bear the lot number shown on the certificate. The contents of improperly marked containers shall be destroyed or exported if in the judgment of the inspector the fruit has not been fumigated. The total number of containers off-loaded should agree with certificate total.



## SECTION IX - COSTS

### A. Fumigation Plants and Facilities

All costs of constructing, equipping, maintaining, and operating fumigation plants and facilities and the carrying out of post-treatment safeguards shall be borne by the cooperative agreement contractor or contractors.

### B. Supervision of Treatments

Where a chamber approved by the Plant Quarantine Division is located in a Mexican city immediately opposite a city in the United States where a Plant Quarantine office is located, supervision by the inspectors will be furnished at no cost during the regular working hours, depending on their availability. When normal inspectional activities preclude the furnishing of supervision during regularly assigned hours of duty, supervision will be furnished when requested on a reimbursable overtime basis and the owner will be charged as prescribed in Agricultural Research Service's AM 323.2 and 7 CFR §354. Where fumigation chambers approved by the Plant Quarantine Division are located in the interior of Mexico, supervision is performed under a cooperative agreement between the Agricultural Research Service and the parties in interest. The interior of Mexico may be construed as all other locations in that country which are not immediately opposite United States cities where a Plant Quarantine office is located.

## SECTION X - ADMINISTRATIVE AND CLERICAL FUNCTIONS

### A. Report of Services Performed

#### 1. Purpose

Two copies of PQ Form 915 (see page 24) entitled, "Report of Services Performed, Contributed Funds - Mexico," are to be submitted by each inspector performing services in Mexico at the close of business of each pay period for each contractor. This report provides:

- a. Statistical data on fruit certified.
- b. Travel and per diem information necessary for the preparation of SF-1012, Travel Voucher.
- c. A summary of overtime services necessary for the preparation of BFD-95, Time and Attendance Report and Pay Slip.

#### 2. Distribution

Forward original to Regional Supervisor's office; retain carbon copy in certifying inspector's port files.

#### 3. Submission of report

The PQ 915 report must be submitted immediately after the certifying inspector returns from Mexico or immediately after the close of a pay period whichever is appropriate.

Also, a PQ 915 report on Item A1(a) above is required in the Regional Supervisor's office immediately after the end of a calendar month.

#### 4. Submission of expenses to contractor

An inspector who works for Contract 761, Asociacion Mexicana de Empacadoras de Citricos, must submit to the association office each week, a breakdown of expenses charged against individual packing sheds. He completes three copies of the form, "Asociacion Mexicana de Empacadoras de Citricos" (see Section XI), and submits two copies to the association and returns one copy to the inspector's home port office. Aside from the inspector's name, name of packing shed, and date worked, the inspector completes only the first five entries of the form. They are: Rate per hour regular time, rate per hour overtime, travel charges, number of hours regular time, and number of hours overtime worked.

#### 5. Per Diem

Per diem is to be prorated in fractions of not less than one-eighth day or in multiples thereof, among the cooperative agreement contractors on PQ Form 915.

#### B. Tour of Duty

To the extent possible, assignments in Mexico will follow a standard tour of duty schedule - 8 a.m. to 5 p.m., Monday through Friday. Deviations from this schedule are permitted if during the first week of the assignment the inspector is already working a nonstandard tour of duty at his official station. In the event that the inspector has not had one or both of his nonworkdays prior to his assignment in Mexico, the following Saturday will become one of his nonworkdays and the other will be at the discretion of the inspector. The second week of his tour of duty will always follow the 8 a.m. to 5 p.m. schedule, Monday through Friday.

#### C. Travel

1. The inspector must have in his possession a valid official passport while on assignment in Mexico.
2. Travel time for which reimbursement is made by the cooperative agreement contractor or contractors is that period of time used in actual travel both to and from the place of assignment in Mexico and the official duty station of the inspector. Travel time is in accordance with Agricultural Research Service AM 351.1.
3. Vehicles used by the cooperative agreement contractor to transport plant quarantine inspectors to and from Mexico must be in good, safe, operating condition. Should the transporting vehicle be of U. S. registry, the cooperative agreement contractor is required to furnish title papers and a notarized letter of authority for the inspector to operate the vehicle. These papers are necessary for the inspector to operate the vehicle in Mexico.

#### 4. Travel voucher (SF-1012)

The inspector must submit SF-1012 at the close of business of each pay period for travel and per diem expenses incurred within such period. Details of travel, per diem, and other expenses set forth on PQ Form 915 are to be summarized on SF-1012.

#### D. Claims for Miscellaneous Expenses

1. Purchases and other items normally submitted as expenses on travel vouchers can be charged directly to the cooperative agreement contractor for whom the expenses were incurred.
2. Supporting sales slips, ticket stubs, and other receipts are to be retained and submitted with the SF-1012. Those receipts indicating payment made in foreign currency should be accompanied by a bank statement of sale indicating the rate of exchange.



# SECTION XI - SAMPLE FORMS

U. S. DEPARTMENT OF AGRICULTURE AGRICULTURAL RESEARCH SERVICE PLANT QUARANTINE DIVISION		
CERTIFICATE OF INSPECTION AND TREATMENT		
1. PLACE <u>Montemorelos, N.L., Mexico</u>		
2. DATE <u>4/7/65</u>	3. NO. <u>18997</u>	
This is to certify that the commodities described below have met the requirements of inspection and treatment of Quarantine No. 56 as amended.		
4. COMMODITY	5. CONTAINER SIZE	6. NO. OF CON-TAINERS
<u>Oranges</u>	<u>5# bags</u>	<u>2640</u> *
<u>✓</u>	<u>1/2 bruce</u>	<u>59</u>
<u>✓</u>	<u>90# bags</u>	<u>20</u>
7. TRUCK NO. <u>7-43-61</u>		8. TRAILER NO. <u>—</u>
This carrier has been inspected and found to be free of citrus leaves and any other objectionable plant material at the time of loading.		
9. PACKING SHED <u>Emp Uriegas</u>		
10. CONSIGNOR <u>Same</u>		
11. CONSIGNEE <u>Pride O' Texas</u>		
12. REMARKS  <u>* 220 mc/12-5 16 bags each</u>		
13. SIGNATURE OF PLANT QUARANTINE INSPECTOR  <u>J. C. Orrill</u>		
PQ FORM 369 AUG 1963 EXISTING STOCK WILL BE USED.		

U. S. DEPARTMENT OF AGRICULTURE  
AGRICULTURAL RESEARCH SERVICE  
PLANT QUARANTINE DIVISION

FOREIGN SITE CERTIFICATE OF INSPECTION AND TREATMENT  
(Fruits and Vegetables Enterable Under Quarantine 56)

1. VESSEL <i>Pqn. M/V Triago</i>		2. CERTIFICATE NO. <i>71</i>	
3. PORT OF EXPORT <i>Vera Cruz, Vera Cruz, Mexico</i>		4. DATE LOADED <i>Nov. 16, 1966</i>	
5. SHIPPER <i>Luis Fruit Co. Vera Cruz, Mexico</i>		6. CONSIGNEE AND PORT OF ENTRY <i>Pride 'O Texas Monte Alto, Texas</i>	

7. COMMODITY	8. NO. CONTAINERS	9. CONTAINER MARKS
<i>Oranges</i>	<i>6500 90# bags</i>	<i>Tagged and stamped "Fumigated USDA"</i>
<i>Oranges</i>	<i>5000 90# bags</i>	<i>" "</i>

10. TREATMENT PLANT AND LOCATION  
*Montemorelos, Mexico*

*This certifies that the shipment described above has been inspected and found free of citrus leaves and other plant debris and has been treated in accordance with the provisions of Quarantine No. 56 for entry into the United States.*

11. SIGNATURE OF PLANT QUARANTINE INSPECTOR <i>J. C. Averill</i>	12. DATE <i>Nov. 16, 1966</i>
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PQ FORM 3  
OCT 1963



ASOCIACION MEXICANA DE EMPACADORAS DE CITRICOS, A. C.

Apartado No. 89  
Montemorelos, N. L., México

Nº 0408

PLANT QUARANTINE SERVICES

Empacadora Urieggs

Inspector F.C. Quesada

From 10/16 DATE to 10/23

REGULAR TIME (Tiempo Regular)	OVERTIME (Tiempo Extra)	
Rate per hour (cuota por hora) <u>\$ 4.58</u>	Rate per hour (cuota por hora) <u>\$ 5.21</u>	Travel Charges (gastos de viaje) <u>\$ 11.00</u>
Number of hours (número de horas) <u>8</u>	Number of hours (número de horas) <u>8</u>	Misc. Charges (if any) (gastos varios) <u>0</u>
Sub-total		
8% of Regular (8% de t. regular)		
Total Regular Charges (total de gastos regulares)	Total Overtime Charges (total de gastos de tiempo extra)	Total Travel and Misc. Charges (total de gastos de viaje y varios)
TOTAL		
15% Administrative Charges (15% gastos administrativos)		
TOTAL CHARGES Total de Gastos		

Copia amarilla - Inspector



SECTION XII - FUMIGATION CHAMBER PLANS

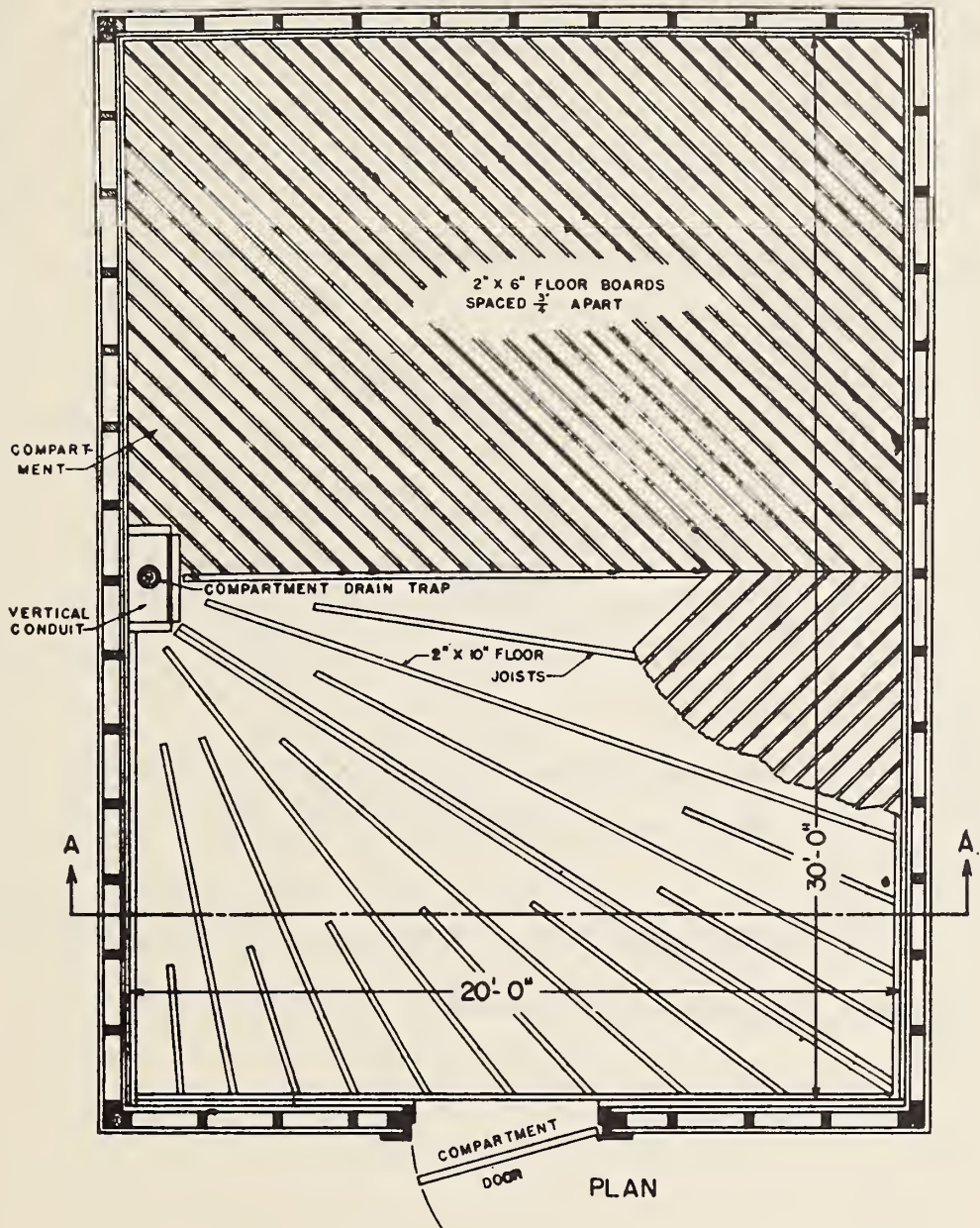


Figure 1. Details of wood false floor of fumigating chamber.

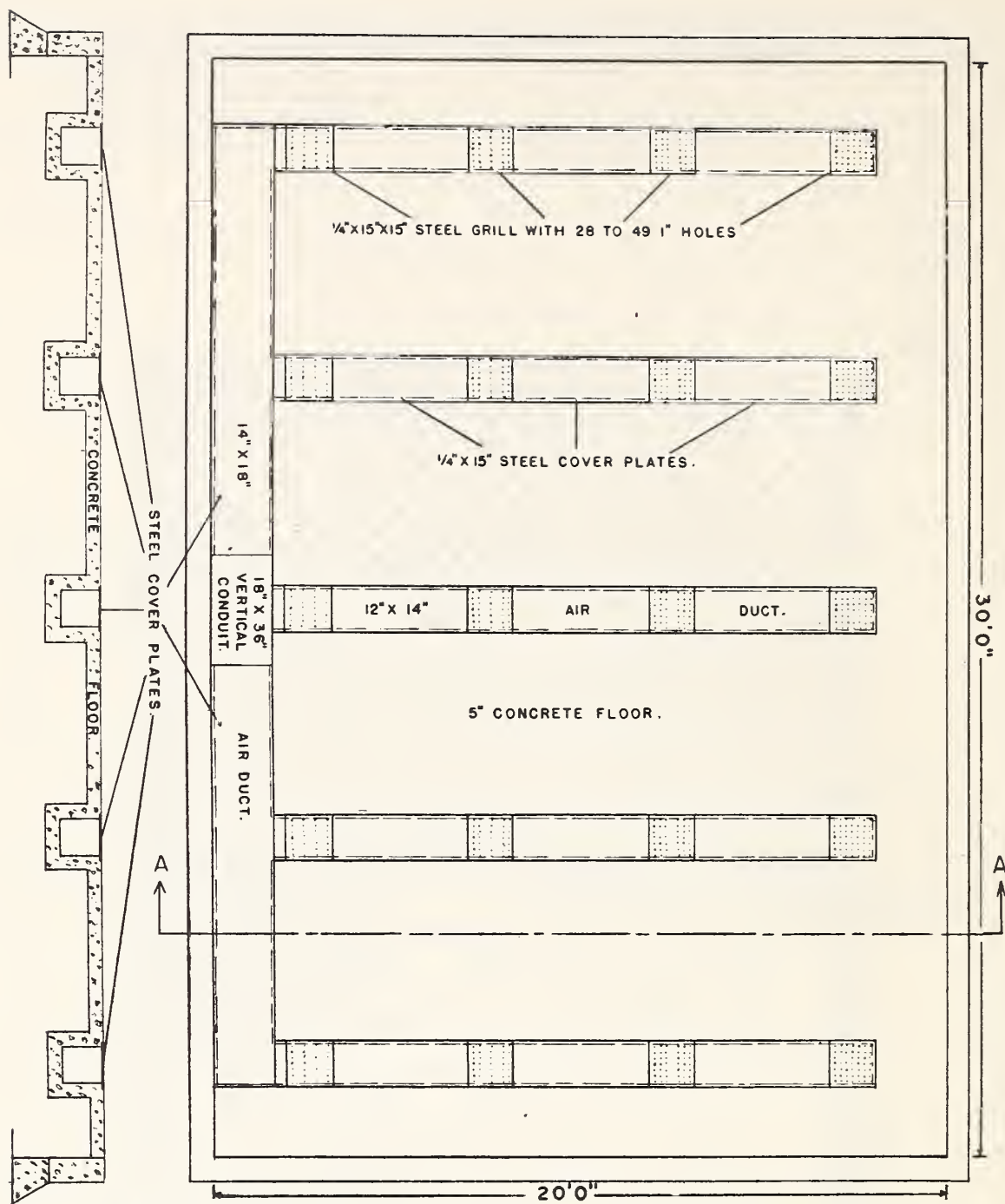


Figure 2. Details of cement false floor of fumigating chamber.



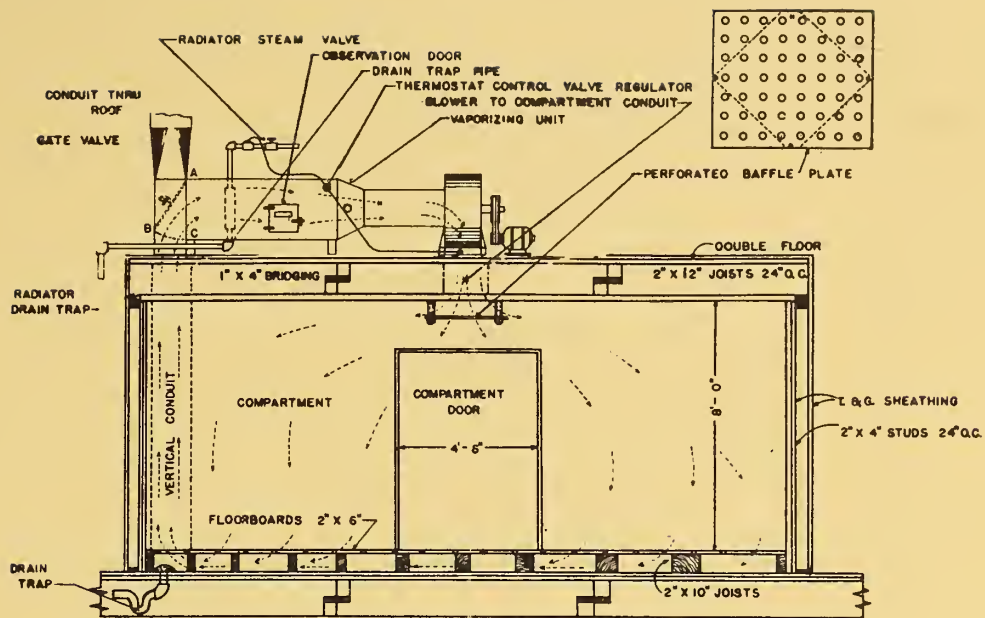


Figure 3. Details of wood false floor of fumigating chamber.

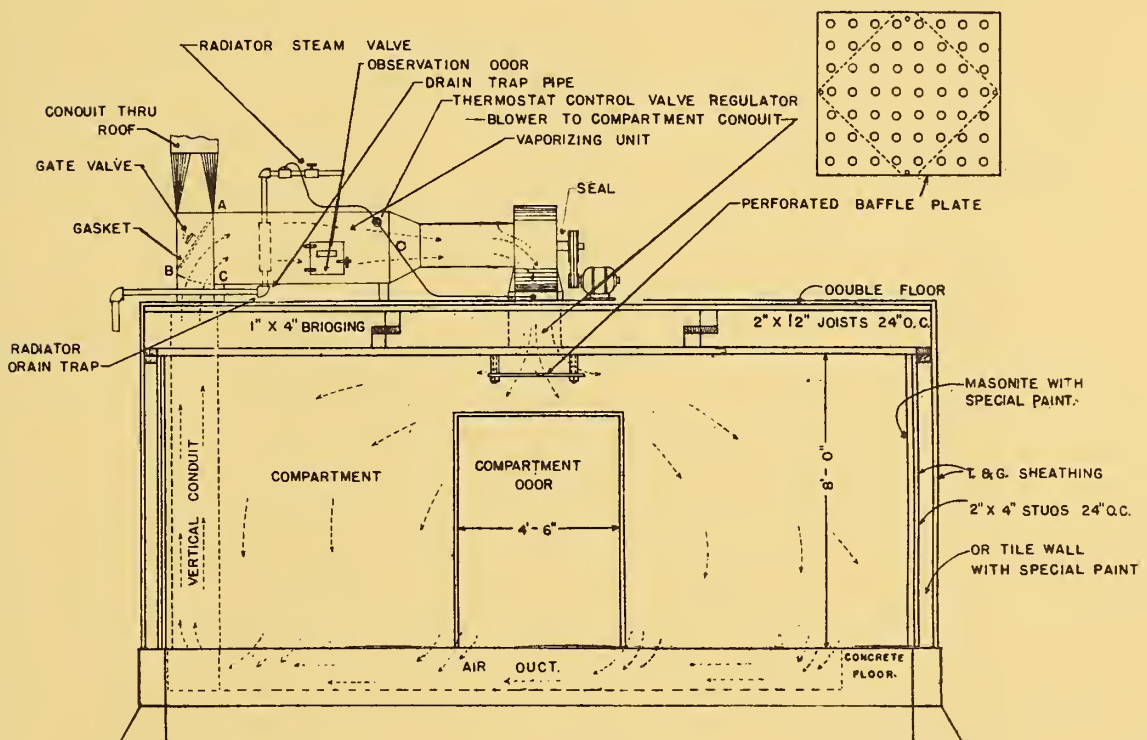


Figure 4. Details of concrete false floor of fumigating chamber.

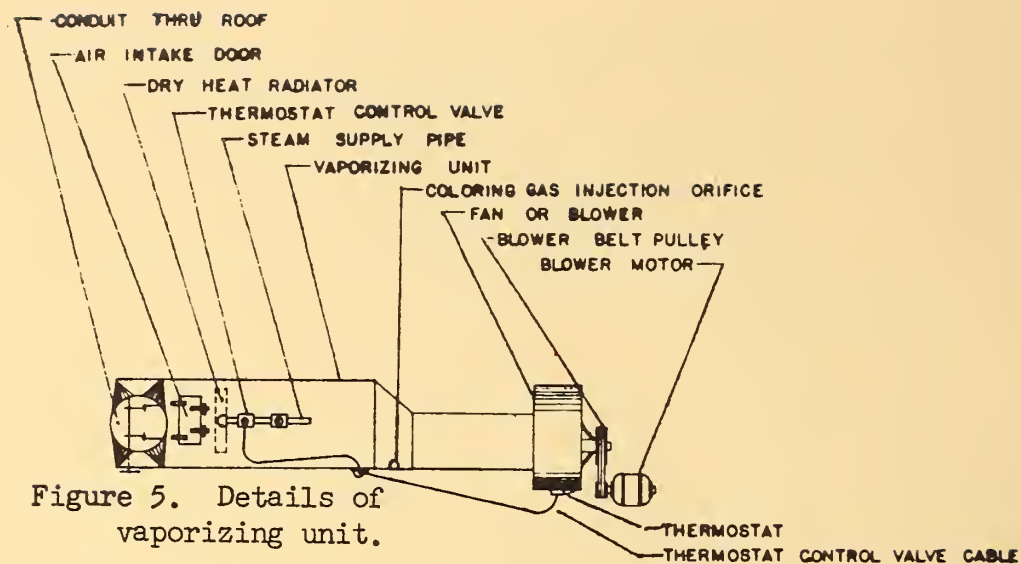


Figure 5. Details of vaporizing unit.

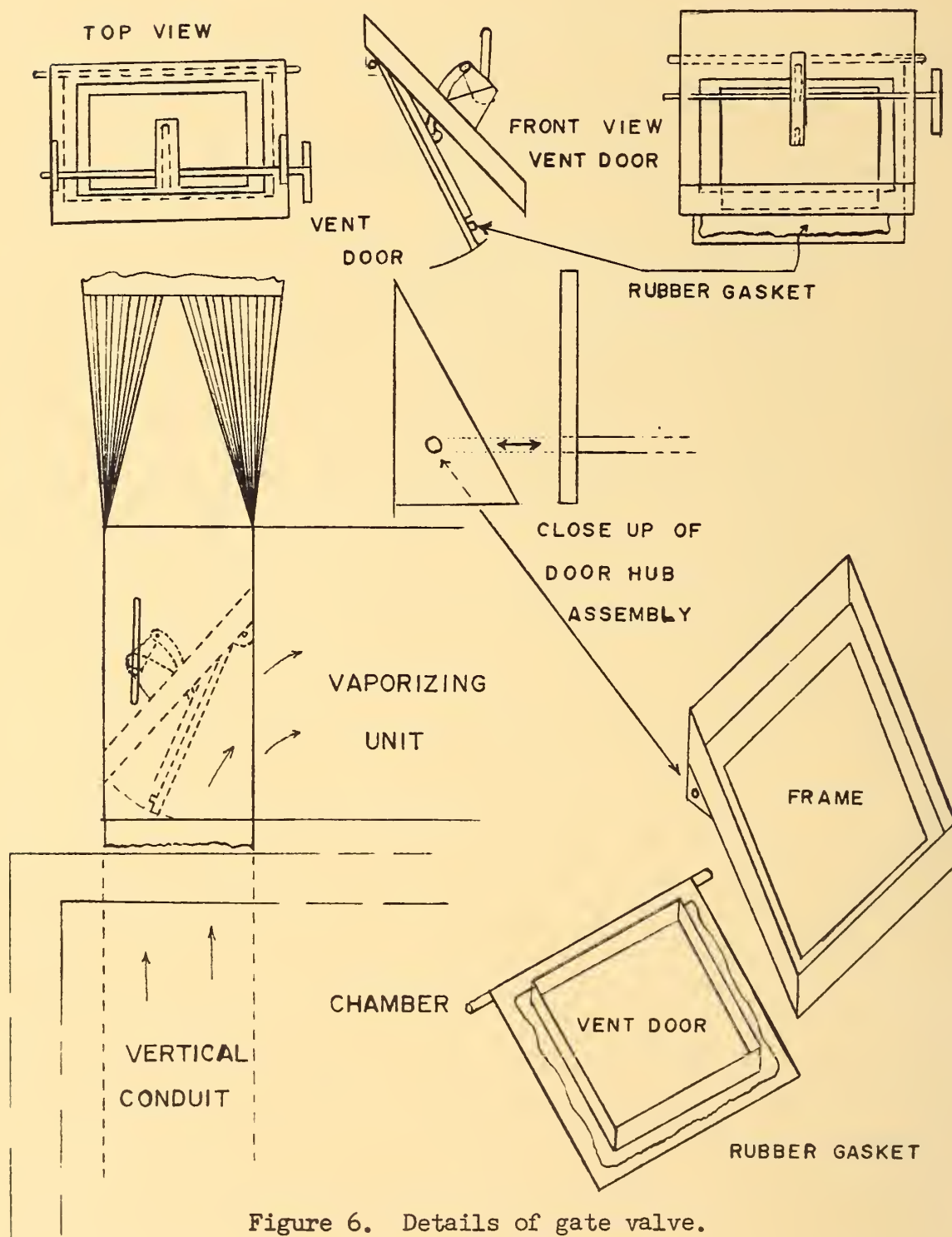


Figure 6. Details of gate valve.